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FOREST AREAS IN EUROPE AND AMERICA, AND PROBABLE FUTURE TIMBER SUPPLIES.

By DR. LYONS, M.P.

Through the agency of the Foreign Office I have been engaged, for the last couple of years, in making extensive inquiries as to the forest areas and probable future timber supplies in Europe and America. The Colonial Office has also placed its resources at my disposal, but the inquiries in this direction are not yet completed, and an important part of the question, viz., the actual extent of the timber supplies available in the Dominion of Canada, has yet to be ascertained. These inquiries are being prosecuted by the direction of the Viceroy and Council, and I expect by an early date that complete returns will be available to throw full light on this the only as yet unsettled portion of this vast question.

The following table gives the most recent returns as to the areas, in statute acres, of the principal countries of Europe and the areas occupied by woods and forests. A summary for America is also appended from the most recent returns of the United States Department of Agriculture:—

Woods and Forests in Europe and America.

	Area in statute acres.	Woods and Forests acres.
Russia in Europe ...	1,244,367,351	527,426,510
Norway	76,716,965	18,920,509
Sweden	100,514,956	42,365,938
Denmark	8,573,396	398,877
Germany	133,075,923	34,181,974
Holland	8,009,328	532,714
Belgium	7,280,362	1,073,452
France	30,557,281	22,687,716
Italy	73,191,882	9,031,310
Austria Proper ...	69,388,482	23,230,412
Hungary	83,205,120	22,514,450
Woods and Forests in England, 1881.		
In grazing counties		761,892
Corn counties		704,146
England ...	Total area, 77,000,000	1,466,038
Scotland (say ...		750,000
Ireland (say) ...		350,000
America	2,291,355,048	380,000,000

In an instructive Blue Book, "Commercial No. 31 (1884)," will be found the Reports of Her Majesty's representatives

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abroad on the cultivation of woods and forests in the countries in which they reside, and to this I have added a *précis* of the reports on forests issued by the United States Department of Agriculture.

The summary of the forest areas of the different countries of Europe is somewhat variously estimated. It probably reaches the total area of between 700,000,000 and 800,000,000 acres, of which Russia alone presents some 500,000,000 acres. No absolute accuracy can be expected in such summary statements, as large areas of forest remain to be ascertained by close survey. It is also to be borne in mind that in natural forests, which have not been at any time brought into regular cultivation and carefully tended for a series of years, much of the timber is usually found to be comparatively worthless for commercial and industrial purposes. Forest, left to Nature, has a tendency to be invaded by swamp; the undergrowth and interlacing of trees injure their form, dwarf their growth, and in many instances reduce them to the condition of scrub or brushwood, and thus they become of comparatively little value, except as materials for firing. A large percentage of reduction must therefore be taken into account in estimating the probable value of forests which have not yet been submitted to any regular system of conservancy. This has been especially noticed in our wide experience of Indian forests, where, prior to the period of survey and demarcation and the forest conservators' care, extended over many years, large tracts of woodlands have been found to give but imperfect supplies of timber for commercial and industrial purposes.

In the principal countries of Europe within the last quarter of a century special attention has been given to the question of forest conservancy, and the areas of forest assigned to the countries in the above table, with probably the exception of the outlying districts of Russia, may be taken as fairly representing acreage available for productive forest working in the immediate future. It is to be remarked that with regard even to those countries in which forest conservancy has been carried out for the longest period and with the greatest care, it is not pretended that the domestic timber supply is fully adequate to the domestic demand, with perhaps the exception of Sweden and Norway. Thus in France the annual domestic supply of forest timber is estimated at 36,000,000 steres, while the annual consumption is 55,000,000 steres, thus necessitating an annual import of 19,000,000 steres to make good the national deficiency. Russia, with apparently inexhaustible stores of forest, feels the necessity of still further increasing her national wealth in this respect, and extensive reafforesting operations are being carried out in the great Steppe country. As well pointed out by Mr. Herbert, in his very able and exhaustive report to Lord Granville, the forest distribution in Russia is geographically in the least convenient positions for the general service of this vast empire. Thus the north and east governments have 54 per cent. of their area under forest; those governments adjacent to the Volga 23 per cent.; the governments in the centre of the empire 15 per cent.; the Ukraine but 14 per cent.; while the Steppe governments have but 1·3 per cent.; so that, should the nine governments in the forest zone of Russia be excepted, she is poorer in the proportion of forests to her acreage than either Germany or Austria. This unequal distribution of forest exercises an evil influence from an economic point of view. Water communication is not everywhere available, and the carriage of wood by rail is too costly, and is impossible on an extensive scale.

In Russia up to 1st of January, 1882, something under eleven million dessiatines (2·69 acres), or only 8 per cent., were under properly regulated forest control. Half a million dessiatines more had been taken in hand, but were not in full working order. At the present day, in order to meet the requirements in the different provinces or governments of Russia, it is necessary to cut down annually about 1,200,000 dessiatines of forest for firewood, giving about 31,000,000 cubic fathoms of timber for this purpose. Steamers burn annually nearly 1,000,000 cubic fathoms, and the railways consume a very large, but not well-ascertained amount. Timber is largely used in Russia in house construction. Out of 1,820,000 inhabited houses in the central governments of Riazan, Tula, Kaluga, Orel, Kursk, Voronetz, Tamboff, and Pensa, only 74,000 are built with stone and mortar, and in the governments of Moscow, Iver, Yaroslav, Kostroma, Nijni Novgorod, and Vladimir, out of 1,400,000, only 6,800 are built of stone and mortar. How frequently these wooden houses have to be renewed is tolerably well shown, says Mr. Herbert, by the saying that Russia is burnt down every seven years. Forest fires must also be taken into consideration, by which timber is said to be destroyed of an average estimated value of £10,000,000 yearly. It will thus be seen that, between forest waste, forest fires, imperfectly grown woodlands, and home consumption, a very ample reduction must be made in the forest wealth of Russia before she is able to make any very considerable contribution to the wants of the world at large in timber.

That a full sense of the want of afforesting is felt by Russia herself is shown by the continuous action of several of her ablest statesmen in promoting tree-planting on the vast steppes of southern Russia. This enterprise has been in operation for more than a quarter of a century, and vast tracts of the once barren steppes are now covered with successful plantations, which are not less important from a climatic than from an agricultural standpoint, as the protection they afford has enabled corn and other crops to be raised where bleak and barren sands alone previously prevailed.

I have dwelt thus in detail on the question of Russian forests because of the general and vague expectations entertained as to the unlimited supplies to be derived from that country. The sum of Mr. Herbert's very industrious labours appears to be that, after all Russia's own demands, the supplementary wants of the other countries of Europe cannot be expected to be supplied by her to any very much larger extent in the near future than at present when (in 1880) she exported 34,000,000 roubles worth, but imported herself nearly 10,000,000 roubles' worth.

To Norway and Sweden Europe has been long accustomed to turn with reliance upon apparently inexhaustible supplies; but a critical examination of the Foreign Office reports will be found not to sustain this expectation. Taking the report of the Director of Forests for the period between January, 1875, and the 30th June, 1880, we find that the total area of the public and semi-public forests would amount to 9,932,115 maal (equal to 76·64 Norwegian square miles of forest land, or 977,618 hektar, equal to 9,776·18 square kilom.). If, says M. Michell, the total area of forest land in the kingdom of Norway be estimated at about 612 Norwegian square miles, equal to 78,067 square kilom., the public and semi-public forests must represent about 12·52 per cent. of the forests. If, on the other hand, the productive powers of the forests be taken into consideration, it cannot be accepted that the public forests constitute anything like so large a percentage of the forests of the country. It is, indeed, principally the semi-public and the purchased forests, and those belonging to the Education Fund, that can in that respect be compared with the private forests; while, on the other hand, the greater part of the State forests and State common forest lands must in that respect be considered greatly inferior, for in these are included many square miles of partly middling birchwood, while as regards the pine forests a quantity not much smaller may perhaps be considered as mountain-wood of small and thin growth, rendering small profits in relation to their large area.

With regard to Sweden the total forest area may be seen from the following figures:—Total area of mainland and islands of Sweden, 40,667,350 hectares; public forests, 5,745,783 hectares; areal percentage of public forests, $16\frac{1}{10}$ hectares; private forests, 30,025,990 hectares; areal percentage of private forests, $83\frac{9}{10}$ hectares. The percentage of private forests is immensely greater than those of the Government, but unfortunately there are no means of obtaining reliable information respecting them, "but what there is," says Mr. Greville in his report to Lord Granville, "all tends to show that fifteen years will see their supplies very materially reduced." More accurate forest surveys are still urgently needed in regard to both Sweden and Norway, as confusion apparently exists in regard to even the latest figures available.

The forest lands of Austria-Hungary are of such extent and importance, and the forest industries have been so carefully and extensively utilized, and submitted to such close analysis, that no survey of European forests would be at all sufficient, that did not take some notice of them, however briefly. They illustrate many points in the commerce of forest produce.

The productive area of Austria is 93·5 per cent. of the whole, and the unproductive only 6·5 of the total area. The forests of Austria are of the actual extent of 94,467 square kilometers, or 31·5 per cent. of the total. The forests of Hungary are 92,742 square kilometers, being 28·8 per cent. The grand totals for the empire and monarchy are 189,209 square kilos., or 30.1 per cent. of the whole. The productive area of the whole thus sums up 583,327 square kilos., with 38,679 unproductive, or 93·8 and 6·2 per cent. respectively. There are 983 agricultural societies doing good work, and many hail and fire insurance companies largely supported by the agricultural community. Austrian industries hold a deservedly high place, and amongst them those connected with wood. Great progress has been made in Austria in the manufacture of Bessemer steel, while Styria and Lower Austria are the greatest producers of wire, and Carinthia of iron plates; further the export of scythes, sickles, and straw cutters averages 8,000,000 yearly. Heavy waggons, street carts, and railway waggons are extensive industries in timber. The chief shipbuilding yards are at Trieste and Pola. Furniture goods in timber occupy large numbers of persons, and carvers' work is extensively carried on amongst the mountain populations in their homes. Germany takes forty million meter centners of Austro-Hungarian wood, coal, and turf, unfortunately all grouped together. Russia, Roumania, and Italy take from two to three million centner each, similarly grouped, while exported wood also finds its way to Servia and Switzerland. The total wood export now reaches the large figure of 20,500,000 centners annually.

It is not possible to deal with the subject of forestry in the United States of America without some notice, however brief, of the great national "Department of Agriculture" which has grown up within a few years, and now plays such an important part in the agricultural economy of the whole Union. So far as a general system of forestry can be said to exist in the States, it ranges itself under this great department. But, unfortunately for the whole country, the instances are too few as yet in which the forest interests of the states and territories have been brought within its operation, and a reckless practice of felling and sale has been pursued without the least effort by the Union as a whole at replanting to keep up supplies of timber for future demands.

Starting from the conviction that timber was superabundant and inexhaustible, when it was not actually regarded as an encumbrance on the soil and an impediment to agriculture to be got rid of in the speediest way possible, the last quarter of a century has seen a wholesale destruction of national wealth probably without parallel in the history of any people pretending to realize the conditions requisite for the continued prosperity of a rapidly increasing human community. Forests have disappeared from districts thickly wooded within the memory of men still far from aged; 12,000,000 acres have disappeared from the line of the Mississippi.

In the general distribution of forests in the States the whole region east of the Mississippi was a well-timbered country, with the exception of the prairies and "openings" in the states north of the Ohio, and the great "barrens" of Kentucky and Tennessee. A large strip of timber lay to the west of the Mississippi, and beyond that a vast vertical band of treeless territory was met with extending from Mexico northwards towards the Arctic Ocean. The line of the Pacific states and territories, well supplied with a glorious vegetation of its own, amongst which reigned supreme the great redwood conifers of California, formed the westward boundary of the broad vertical belt of "lone" land just referred to. On the coast, where the Pacific rains are abundant and the soil and climate favourable, limited areas are met with bearing a forest growth remarkable for the great size and density of the timber. An almost universal feeling of false security seems to have prevailed in the States until within the last few years as to the inexhaustible supplies which were to be depended on. Thoughtful and observant men had no doubt from time to time called attention to the reckless waste that was proceeding all around unchecked, but the public ear was not reached. The results of the census of 1870 seem to have first strikingly arrested the public mind. An Act was passed in 1876 requiring the Commission of Agriculture to appoint some man of approved attainments to ascertain the annual consumption, import, and export of timber and other forest products, and Dr. Franklin B. Hough was appointed to the duty, and it may be truly said that no more competent or zealous official ever filled an office of similar importance or accomplished more good work within the period since elapsed.

Dr. Hough's inquiries have been diligently prosecuted in studying the great question of timber exhaustion and supply, the equable and seasonable distribution of rainfall, the maintenance of forests upon the higher slopes, and the preservation of the regular supply of water to springs, rivulets, and rivers, and the prevention of the destructive floods which wash bare the unclothed mountain sides, and by sudden overflows destroy the agriculture and manufactures of the valleys. Special attention has been attracted to this water question in connection with the alterations from floods and silting of the Wheeling Bar of the Ohio, and the unexampled floods of the current year, 1884, in which the waters of that river are reported to have reached a higher level by one inch than at any former recorded period. The Commission further reports :—" A national calamity is being rapidly and surely brought upon the country by the useless destruction of the forests. Much of this destruction arises from the abuse of beneficent laws for giving land to the landless. It is an anomalous fact that the Government is giving away the rich alluvial soil of Iowa, Nebraska, Kansas, and Minnesota to any citizen who will plant a few acres of cotton wood or other inferior timber, while under the pre-emption and homestead laws it is granting a license to destroy millions of acres of fine forests of almost incalculable value, which should be preserved as a nation's heritage." Much difficulty is still experienced in dealing with these complicated conditions arising out of the action of laws framed in ignorance of the elements of the problems to be solved. But as the Agricultural Department is actively rousing the attention of the State Governments to the importance of the timber question throughout the length and breadth of the land, hopes of a better future for forest conservation and extension are now confidently entertained, and suggestions are being carefully considered for legislation based on the experience now accumulated.

The statements of so important a body as the American Association of Science deserve the most serious attention. They have recently addressed to the Legislature a memorial, in which they say :—We would earnestly invite the attention of your honourable body to the great and increasing importance of providing by adequate legislation for the protection of the existing woodlands of the country against needless waste, and for the encouragement of measures tending to the more economical use and the proper maintenance of our timber supply.

It is evident that the consumption and waste of the forests of the country much exceed their restoration by natural growth, that the native supply of timber of the better class is rapidly becoming less, and that the demand for building purposes, manufactures, and other uses is rapidly increasing from year to year. We deem it an established fact that the interests of agriculture are promoted by the presence of a due proportion of woodlands in a country, and that they suffer when clearings are created to excess. The protection which they afford appears to mitigate in a sensible degree vicissitudes of climate, and to maintain the supply of water in springs, rivulets, and wells. They shelter a country from injurious winds, and may be made practically useful in preventing or diminishing the drifting of snows and sands and damage from torrents, and in limiting unhealthy emanations from marshes. Their influence in connection with water supplies for cities, and the maintenance of hydraulic power, and of navigation in rivers and canals when these may be affected by drought, deserves serious attention.

Starting with a clearance of 12,000,000 acres of forest in the Mississippi regions, we may refer to the vast annual consumption of timber by the 112,000 miles of American railroads, the construction of which took nearly 150,000,000 trees, or the produce of nearly 3,000,000 acres of land.

Railroads and manufactures combined are estimated to consume annually the produce of 175,000 acres of forest.

It is roughly stated that 10,000,000 acres of forest are consumed annually, while but 10,000 are planted. Minnesota has taken the lead, and Nebraska a very prominent place, in the movement of replanting, to which a special day, "Arbor Day," is consecrated. In 1876 it is stated that nearly 800,000 trees were planted in Minnesota on "Arbor Day," and 5,000,000 trees during the season. These are spirited and laudable efforts, but it is hard to keep up such popular enthusiasm. Over 400 miles of windbreaks are stated to have been planted, and the state of Minnesota is credited with a total of 26,500,000 trees planted ; but no statements are available as to the total amount of reboisement or re-afforesting throughout the Union. The vast territory drained by the Mississippi, and including more than half of the whole area of the United States, has been compared to an immense farm, having only a little clump of trees in its north-east corner, and the justness of the comparison is said to be shown by inspection of the map, which shows the enormous extent of plain, mostly treeless, within the territory below the woods of Michigan, Wisconsin, and Minnesota. The eastern or New England States, including Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut, and the central states of New York, New Jersey, Delaware, Maryland, Ohio, and Indiana, were one dense forest comparatively a few years ago, covered with groves of the finest pine. These states are now almost wholly stripped of their timber, with the exception of Maine, which still has some timber, and they are still wasting the supplies which remain, and are obliged to purchase timber from Michigan and Canada. Eleven other states produced a less amount than Pennsylvania, and not half the produce of Michigan. California and Nevada are said to have scarcely enough to supply their own wants.

Judged by another standard the general deficiency of the Union will become strikingly apparent. From the most careful estimate, based on prolonged scientific examination, the conclusion has been reached that for the best interests of any country, unless under very exceptional circumstances, from one-fourth to one-third of its total area should be preserved in a wooded or forested condition. The old rule of the Duke of Burgundy was, one-third to the hunter, two-thirds to the husbandman. The rule of William Penn was one acre in woods for five cleared for agriculture, exclusive of the wooded hills and mountain forests. With her area of over 2,291 millions of acres, and at present probably less than 380 millions of acres of forest, the Union has but one acre of forest to six of uncovered land. It is time, therefore, that her statesmen should take the position of the Union as to forest to heart, and the friends of the great Republic cannot but rejoice that the question has fallen into such able hands as those of the present heads of her great Department of Agriculture, so worthily rivalling the development which another not less important department, that of her fisheries, has achieved.

With a population fast being multiplied, and possibly destined at least to double itself in the next fifty years, and with her industries making such giant strides, and ever demanding fresh materials to work upon, and with the already known deficiencies in many materials of various industries—bark for tanning, willows and osiers for wicker-work, sensible diminution in many of the most esteemed woods, it is patent to all that no exports of timber of material importance can be expected to be contributed by the Union to supply the deficiencies of Europe. The States themselves are largely leaning upon the Canadian forests, and much timber credited as export to states of the Union is but transferred from Canadian forests or ports to American in transit.

Professor Sargent, who is curator of the Arnold Arboretum, of the Harvard University, is also the Special Forest Statistician of the United States Bureau. He is stated to have reported in 1882 to the Massachusetts Board of Agriculture that only 80 billion feet of white pine remained at that time in the United States, and this total was said to include much small and poor timber. He estimated the annual consumption at 10 billion feet, and the cut for the year next after his estimate was the largest ever made. The second year is closing since this revelation was made. The estimated value at the saw-mills was 300,000,000 dols., and 450,000,000 dols. at the places of consumption; and to replace it from other lands, if they could spare it —which they could not—would cost two to three times more, and would require more than all the tonnage of sea-going vessels in the world to transport it. Here, then, observes this authority, after special study of the question, is a commodity which will soon be gone, and, when gone, would cost not less than a billion dollars a year to replace, if it could be had. Care and economy in the use of what remains is an obvious remedy much needed when we are informed of the wasteful processes of pine lumbering, experts stating that fifty small trees are sacrificed in getting out one large one, with the ever-recurring waste and destruction from forest fires, caused by the carelessness of campers, hunters, and anglers. Forest fires involve waste of timber by the square mile. Adequate care and thrift promise large results, but the sum of opinion points to re-afforesting as the one great hope of an adequate extension and restoration of the American forests; and such is the settled view of the able and enlightened men who preside over the great Agricultural Department of the United States.

While the timber supply of the States constitutes the most immediate and urgent need of the Union, the forest authorities of America are no less alive to the great and equally necessary functions which woodlands fulfil in regard to climatic conditions, the regulation of water supplies, and the maintenance of the channels of rivers and inland navigation. This great complex problem, so fully recognised over two hundred years ago in France by the association of Waters and Forest Conservancy, "Les Eaux et Forêts," in the statute of Colbert, 1669, is being studied in the profoundest manner by the highest scientific authorities of the United States, and the most valuable results may be anticipated. But a question of even still, if possible, more striking interest has been elucidated by the profound attention now devoted to such studies in America. It has been long known and well established that the development of the industries depending mainly, if not necessarily, on abundant timber supplies, in conjunction with those dependent on the mineral kingdom, exercises the most material influence on the activity and the value of the agricultural operations, and in a surprising manner enhances their productiveness and the material wealth produced from them. Thus the most flourishing conditions of agriculture are to be found not in the exclusively agricultural states, but in those in which a proper proportion of agricultural development is associated with a like state of advancement in industrial energies. Prices of labour, produce, and all sorts of materials rule higher, and the general state of the community is increased in prosperity. The details of this interesting problem are worked out with striking illustration from the condition of things in Virginia and Pennsylvania. But this is a subject which, however important, would be somewhat out of place in these pages.

The forest wealth of the United States, it is estimated, represents 700,000,000 of dollars per year; but such are the domestic demands for forest products that the Union is now and for some years past has been drawing largely on the Dominion of Canada, and no expectation can be reasonably entertained that she will ever again be a large exporter to Europe.

Canadian Supplies.

The call which for some years back has been made on Canada is perhaps the most serious problem in the whole question of future timber supplies. That she is very largely supplementing the requirements of the Union is well known, but to what extent it is very difficult to ascertain, as a very extensive trade is carried on across the borders and much timber shipped from American ports and credited to the States has but recently been brought within the States. Three very extensive timber agencies are well known: the "Ottawa Agency," the "Belleville," and the "Western Timber District." The Crown Timber Office acts for the provinces of Ontario and Quebec and for the Dominion Government in the collection of State dues. The Ottawa drains about 8,000 square miles. Over four-fifths of the pine shipped to the United Kingdom is reported to be manufactured in this great valley, which is said to give occupation to 25,000 men. The area of the timber lands of the Dominion is roughly estimated at 280,000 square miles. It cannot be said that the valuable forest areas of Canada have as yet been defined by survey with sufficient accuracy. It is stated that the true forest areas would scarcely cover a tenth part of the surfaces. The great Saskatchewan Valley, equal to thirteen states of the size of New York, is returned as chiefly prairie, and practically treeless. Oak crosses the border from Michigan and Ohio. It is asserted that in the provinces of Ontario, Quebec, New Brunswick, and Nova Scotia the pine and spruce, the great materials of foreign export, and under contribution for more than a century, will be entirely cut within a few years. Little and others assign a limit of seven years. The wooded lands are still counted at millions of acres, but both in the States and Canada unknown quantities of mere coppice and scrub exist, the timber of which would not pay its own transport to the most moderate distances; while millions of acres still counted as forest are in the state of charred remnants of forests burned over for miles upon miles, and the timber of which has been totally destroyed. The recklessness of waste and belief in inexhaustibility cannot be more strikingly illustrated than by the well-known incident of forests set on fire purposely to show the grandeur of the scene, and allowed to burn themselves out without thought of rescue, when the curiosity of the perpetrators has been satisfied with inspection of the tremendous ravages and the grandeur of the scene thus criminally and wantonly produced.

No unified system of forest statistics exists for the Dominion as yet. Each province keeps for itself such records as it possesses. By the kindness of the Governor-General and Council this is about to be remedied, and I hope through his Excellency's kindness to be shortly in possession of full details as to the forest wealth of the Dominion.

By a recent Act, assented to in the current year, 19th April, 1884, full power is given to the Governor in Council to make provision for the preservation of forest trees on the crests and slopes of the Rocky Mountains, in order to maintain throughout the year the proper volume of water in the rivers and streams, and to set aside and appropriate adjacent lands as forest parks.

With every state in Europe and America alive to the urgent necessity of forest work, and with the example of the great forest system of India before us, not yet forty years under conservancy, but already controlling sixty to seventy thousand square miles of forest, shall these islands alone stand aloof from the great work of forest conservancy and extension? Out of 77,000,000 acres it is possible for England, Ireland, and Scotland to contribute, with advantage to their industries as well as their agriculture, something like 20,000,000 of home-grown forests. The annual importation of timber and other forest produce reaches the enormous sum of £20,000,000 sterling per annum. The day her industries are paralyzed by failure of timber, now within measurable distance of us, this Empire must descend from her high place amongst the Nations.

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